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# PREDICTION OF VELOCITY RATIO IN OPEN CHANNEL FLOW

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The work proposes a relationship between the parameter Φ(M), defined as mean cross section velocity over maximum velocity, and the ratio water depth/bed roughness (D/d) to be implemented to derive the entropy parameter in the entropy velocity profile.

The way to evaluate the entropy parameter M through the ratio Φ(M), still represents a relevant issue nourishing a reach discussion among researchers mainly addressed to the reasonable ground about the invariance of Φ(M) for sections along the same river only at high flow while for low stage the ratio Φ(M) can be affected by the influence of roughness through the relative submergence as well as by the aspect ratio related to the cross section geometry (ratio between flow width and flow depth: B/D). Using laboratory and field data, the classical hydraulic relationships on entropy velocity profile, the uniform flow and regime theory, a predictor for velocity ratio is proposed for open channel flow both natural and artificial ones. The mentioned dependence between the ratio Φ(M) and the relative submergence, D/d, has been studied referring to a wide volume of data. In particular, such influence becomes remarkable whenever shallow water flow conditions occur, that is when the ratio between the flow depth and the reference roughness height is less than 4, while Φ(M) seems to be constant as the value of D/d increases. To enforce this result, a theoretic-analytical formulation, based on entropy velocity profile law and classical relationship for uniform flow and friction factor, is proposed enlightening the general logarithmic relationship existing between Φ(M) and D/d. Further, a possible influence on the ratio Φ(M) can be induced by the aspect ratio (B/D), which plays a relevant role on the velocity profile in terms of velocity dip, that is on maximum velocity location (ymax). Basing on the available data, the relationship between Φ(M) and B/D seems to be depending on whether or not the flow is confined, like artificial channel instead of natural cross section. The comparison between the two set of data, laboratory versus field, enlighten the effect of the aspect ratio which is strongly related to Φ(M) for flume velocity data while it results not depending on Φ(M) for river measurements. Finally, even this last issue enforce the difference between the Φ(M) ratio behaviours for high roughness flow and low roughness one, remarking the value of D/d=4 as operative threshold.